

BOERHAVIA COULTERI VAR. PALMERI, A NEW VARIETAL  
COMBINATION FOR BOERHAVIA (NYCTAGINACEAE) OF  
SOUTHWESTERN NORTH AMERICA

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ABSTRACT

*Boerhavia coulteri* (Hook. f.) S. Wats. var. *palmeri* (S. Wats.) Spellenb., comb. nov., based on *B. spicata* Choisy var. *palmeri* S. Wats., from the vicinity of Guaymas, Sonora, Mexico, is proposed for a *Boerhavia* that differs from the var. *coulteri* in its small fruits and flowers, and its with sparsely-fruited spicate inflorescences. The variety ranges from the Channel Islands of California to the Big Bend region of Texas near the Río Grande, and is very common on the Sonoran Desert. The two varieties are often sympatric, and they intergrade to a slight extent. A key is presented to distinguish the species of *Boerhavia* with spicate inflorescences in the United States.

RESUMEN

*Boerhavia coulteri* (Hook. f.) S. Wats. var. *palmeri* (S. Wats.) Spellenb., comb. nov., basada en *B. spicata* Choisy var. *palmeri* S. Wats., de la vecindad de Guaymas, Sonora, México, se propuso para una forma de *Boerhavia* que difiere de la variedad *coulteri* por su frutos y flores pequeños, y su frutos esparcidos en inflorescencias espiciformes. La variedad se extiende desde las Islas Canales de California hasta la región del "Big Bend" del Río Bravo del Norte de Texas, y es muy común en el Desierto Sonorense. Las variedades a menudo son simpátricas, y se intergradan un poco. Se presenta una clave para distinguir las especies con inflorescencias espigadas de *Boerhavia* de los Estados Unidos de América.

The species of *Boerhavia* with spicate inflorescences have proven taxonomically difficult for the past century, the variation presented by the complex resulting in very different taxonomic treatments. At one extreme is that of Standley (1911) where nine species were recognized. In 1918 Standley submerged *B. watsoni* as a synonym of *B. coulteri*, but maintained the other taxa he had recognized. At the other extreme is Reed's (1969) treatment, in which five of the species Standley recognized [*B. coulteri* (Hook. f.) S. Wats., *B. rosei* Standl., *B. spicata* Choisy in D.C., *B. torreyana* (S. Wats.) Standl., *B. watsoni* Standl.] were placed as synonyms in one variable species, *B. spicata*. Most authors of floras that include all or part of the Sonoran Desert region have followed Standley (1918) in recognizing *B. coulteri*, and also *B. spicata*, and *B. torreyana* if they were present in the area of concern (Spellenberg 1993; Martin & Hutchins 1980; Kearney & Peebles 1964; Munz & Keck 1968; Wiggins 1964). In contrast, Felger (2000) recognized some plants included in *B. coulteri*, as broadly constructed by those authors, as *B. spicata* var. *palmeri* S. Wats. It is this taxon that is recognized as a variety of *B. coulteri* in this paper.

While studying the complex for an upcoming treatment for the Flora of North America North of Mexico, I noted that *B. torreyana* was conspicuously papillate in the sulci between the ribs of the fruit, a character previously unpublished. None of the other *Boerhavia* taxa in the complex are at all papillate. Watson (1889) cited no specimens when he coined the name *Boerhavia spicata* var. *torreyana* S. Wats., but specimens from western Texas collected during the mid-19th century Boundary Survey, very likely seen by him, have papillate fruits (specimens from Torrey Herbarium, NY, have been seen; relevant specimens from GH on loan to ENCB have not been seen). The character of papillae on the fruit is consistent in populations from western Texas, New Mexico, southeastern Arizona at higher elevations, throughout much of Arizona north of the Mogollon Rim, and extreme south-central Utah (= *B. spicata* by Welsh et al. 1987). On very similar appearing plants from the Sonoran Desert region, some of which are identified as *B. torreyana* in collections, but which actually represent *B. coulteri* var. *palmeri* (as proposed below), papillae are absent and sulci are much narrower and less rugose. That *B. torreyana* is clearly distinguishable from other spicate *Boerhavia* has helped to clarify the complex. This is particularly so in Arizona and Sonora where three or four very similar taxa occur within the region.

In 1889 Watson transferred *Senkenbergia coulteri* Hook. f. to *Boerhavia*, and he stated that the collection upon which the name was based was *Coulter 1425*. He noted that the perianth was one line in length (= 1/12", ca. 2 mm) and that fruits were clavate, 1-1.5 lines long, truncate, and acutely angled. Only one such specimen exists in the Hooker Herbarium at Kew. It is labeled as having come from "Alta Sonora, Mexico," and is here considered the holotype (photo and photocopies at NMC). Its fruits are clearly in irregularly fasciculate clusters in the spicate inflorescence, and they are truncate at the apex. On the same page of his 1889 publication, Watson stated that his new variety, *Boerhavia spicata* var. *palmeri*, based on the collection *Palmer 141* from Guaymas, Sonora, in 1887, had perianths 0.5 line long, and fruits clavate-oblong, a line long, obtuse, obtusely angled. He also noted the inflorescence to be "open and very slender." *Palmer 141* is represented by two specimens at GH! (on loan to ENCB, lectotype not selected; fragment at DS!). In raising this taxon to specific status, Standley (1909) had to adopt a new name (*B. watsoni*) because the binomial *B. palmeri* S. Wats. was occupied. He noted that Arizona plants were placed there somewhat doubtfully, suggesting that geography would place them with *B. coulteri*. Relative to other plants in the complex, the plants he identified as *B. watsoni* have smaller, more widely spaced, less clustered fruits (if at all clustered), and seem to have had stems that were decumbent-spreading.

It is proposed here that the populations Standley recognized as *B. watsoni*, and that Watson described as *B. spicata* var. *palmeri*, are part of the *B. coulteri* complex and can be recognized at the varietal level. The following combination is proposed:

**Boerhavia coulteri** (Hook. f.) S. Wats. var. **palmeri** (S. Wats.) Spellenb., comb. nov.  
*Boerhavia spicata* Choisy var. *palmeri* S. Wats., Proc. Amer. Acad. 24:70. 1889.

The differences the two varieties of *B. coulteri* that Watson, and later Standley, noted by their classifications are very apparent in the field in their extreme states, but intergradient plants occur. Occasionally *B. coulteri* var. *coulteri* and var. *palmeri* are intermixed in populations (e.g., Spellenberg & Zucker 12954 = var. *palmeri*, 12955 = var. *coulteri*, AZ, Pima Co., ca. 10 air km SW of Marana, Anway Rd. 1 km S of Avra Valley Rd., 16 Aug. 1999; NMC). In the two mixed populations I have seen, the taxa differed in habit, the stems of var. *coulteri* decumbent at the immediate base, then strongly ascending or erect, contrasting to the more decumbent-spreading habit of var. *palmeri*, but habit is very likely to be influenced by ecological conditions and density of populations. Some mono-varietal populations of the var. *coulteri* have decumbent-spreading stems. The var. *coulteri* also has larger flowers, a denser inflorescence, and fruits in irregular fasciculate clusters, whereas the var. *palmeri* usually has minute flowers, and well-spaced, smaller fruits, the clusters much less pronounced. Plants are most often present in monomorphic populations representing only one variety. The flower of *B. coulteri* var. *palmeri* is illustrated in Spellenberg (2000, fig. 1), but is labelled as *B. torreyana*; the complex was not understood at the writing of that article.

Inflorescences of all the spicate species (*B. coulteri* included) I have observed are visited by various insects in the morning when flowers are open and producing nectar, the insects moving from inflorescence to inflorescence, and from plant to plant. Larger-flowered species are visited more frequently (Spellenberg 2000). In mixed populations, particularly, inter-taxon pollination is very likely, and hybridization is presumed possible. Both varieties of *B. coulteri* are weedy, responding positively to disturbance, and with the advent of increased human impact in arid areas of the Southwest, may have come into increased contact.

*Boerhavia coulteri* var. *coulteri* is geographically the more restricted of the two varieties in the southwestern United States (ranges in Mexico have not been determined), occurring from the eastern to the western borders of Arizona, south of the Mogollon Rim. A population discovered in south-central New Mexico in a well-collected area and may be the result of a recent introduction (N.M., Doña Ana Co., e Las Cruces along University Ave. e of Telshor Drive, 1 km e of IH-25, in gravel planting strip between sidewalk and road, 24 Aug 2001, Spellenberg and Brouillet 13267, DUKE, MT, NMC). The var. *palmeri* occurs throughout the Sonoran region in the United States, from southeastern California to southeastern Arizona. It occurs on Santa Catalina Island in the Channel Islands of California (Standley, 1909, cited as *B. watsoni*, Orcutt s.n., 12 Sep. 1889, US!), where it may have been introduced. In Texas the var. *palmeri* is known from a few collections on or near the Río Grande, the eastern most being from the eastern side of present day Big Bend National Park (M. S. Young, s.n., muddy

bank of Río Grande, near San Vicente [5 mi SW of Boquillas], 26 Aug 1915, TEX [2], LL [1]). On one of these Texas collections, all identified originally as *B. torreyana*, is pencilled, “but looks just like *B. spicata* Choisy Arizona,” the writer probably alluding to its similarity to *B. coulteri* var. *palmeri* of Arizona, as here recognized. Because this is the first report of this taxon for Texas, the two other collections seen are cited here: *L.C. Hinckley 1505*, Presidio Co., Capote Canyon 1 mi. below falls, 28 May 1941, US; *C.H. Muller 8438*, Presidio Co., along washes of rolling Río Grande Plain, 4 mi SE of Ruidosa, 28 Jul 1945, LL. In southwestern New Mexico the var. *palmeri* is occasional and weedy; in the vicinity of Las Cruces it is always in disturbed areas. It may be introduced there, but if so, it is long-established in the region (e.g., *Wooton & Standley 3905*, NM, Doña Ana Co., mesa W of Organ Mts., 4000 ft, 5 Oct 1907, LL, TEX, US).

The spicate taxa of *Boerhavia* in the United States may be distinguished by the following key. In this key the range of fruit length-to-width ratios is given in the format (length/diam. = 1.3–2.1).

1. Fruits usually 4-angled (rarely 5-angled), broadly obovoid (length/diam. = 1.3–2.1); branches of inflorescence usually densely glandular villous, without sticky internodal bands \_\_\_\_\_ **B. wrightii** A. Gray
1. Fruits 5-angled, broadly to narrowly obovoid (length/diam. = 1.7–3.1); branches of inflorescence glabrate to puberulent but not glandular, usually with sticky internodal bands.
  2. Surface of sulci of mature fruit papillose, otherwise smooth or somewhat rugose, the edges of the ridges along sulci strongly rugose \_\_\_\_\_ **B. torreyana**
  2. Surface of sulci not papillose, instead smooth or sometimes rugose, the edges of the ridges along sulci not rugose to strongly rugose
    3. Fruits broadly obovoid (length/diam. = 1.7–2.1), usually overlapping in inflorescence; sulci and ribs slightly rugose; sulci usually about 0.5 times as wide as base of ribs \_\_\_\_\_ **B. spicata**
    3. Fruits narrowly obovoid or obpyramidal (length/diam. = 2.1–3.1), overlapping in inflorescence or remote; sulci and ribs slightly rugose to smooth; sulci 0.1–0.2 times as wide as base of ribs.
      4. Inflorescence with fruits often overlapping 50–100% of their length, commonly  $\pm$  fasciculate in groups of 2–4, each fruit 2.5–3.6 mm long, truncate, round-truncate, bluntly conic, or round apically \_\_\_\_\_ **B. coulteri** var. **coulteri**
      4. Inflorescence with fruits remote or some overlapping 1–50% of their length, infrequently 2–3 in a cluster, each fruit 2–2.4 mm long, occasionally longer, usually rounded apically \_\_\_\_\_ **B. coulteri** var. **palmeri**

#### ACKNOWLEDGMENTS

I acknowledge with gratitude the help of Brian Stannard (K), who sent photocopies and a photographic print of the holotype of *Senkenbergia coulteri* Hook. f. I also thank curators of herbaria who loaned specimens for this study, and to Richard Felger for various e-mail “chats” regarding this taxon.

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